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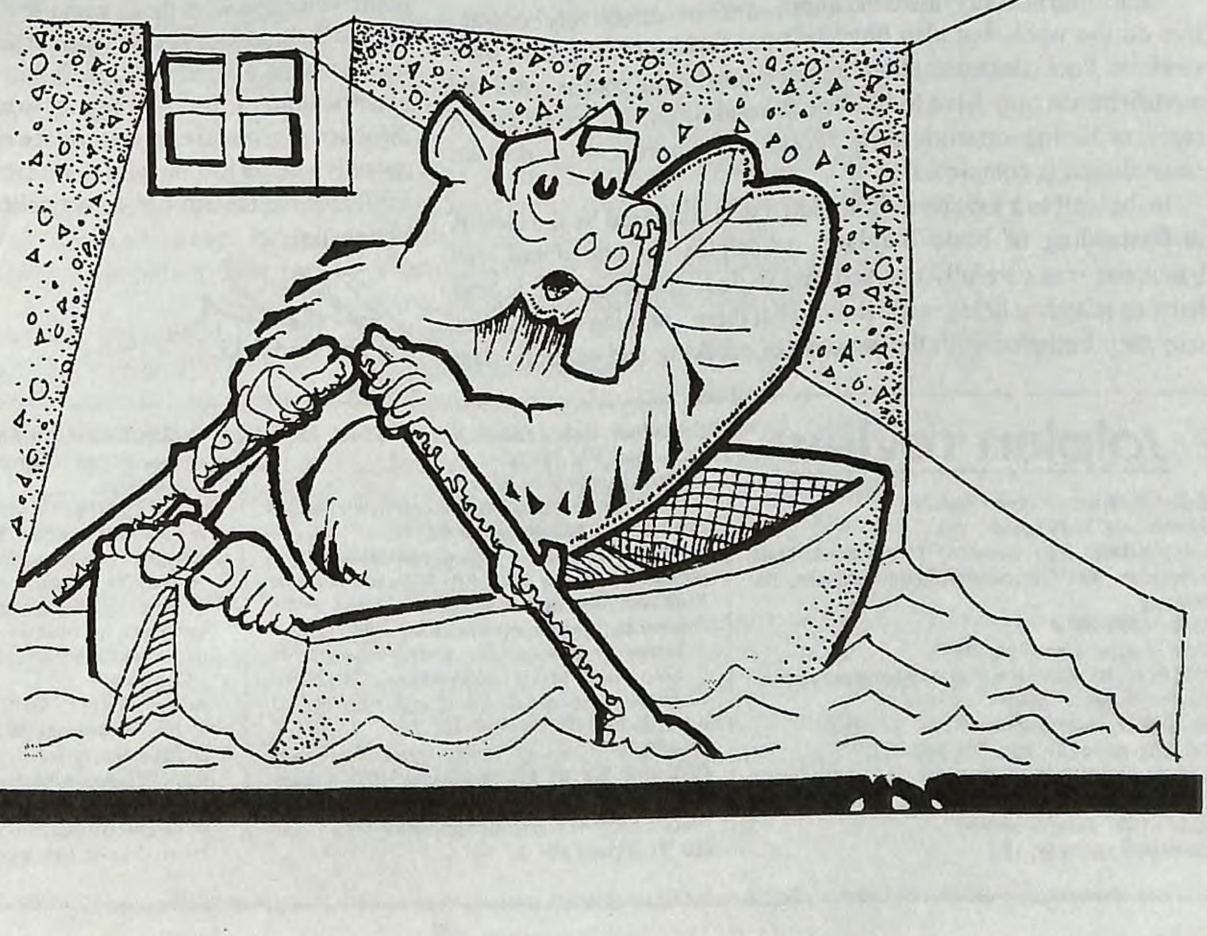
Basement Walls That Dry



From the Editor . . .

Quality is one of those elusive values we all aspire to in our work. We think we know what quality is, but at times it is hard to describe. No one in the construction industry sets out to build a poor product, but the result often lacks quality.

Before you take me to task for a rant against contractors, let me be clear: My thoughts on the issue of quality were focussed after visiting friends who recently purchased a new home in Ontario. My thoughts were reinforced by a visit to a self-described quality development in Colorado. The picture presented is not as pretty as we would like to believe. Too often the quality of the product builders believe they are building falls short on close inspection. Too often the attention to detail required for a good quality, lasting product is lacking.

My friends in Ontario made their purchase decision based on a typical show home display, but did request some upgrades and changes which were duly documented and paid for. Much to their dismay, as they watched construction proceed, they noticed many cases of questionable workmanship and construction detail. Many of the changes and upgrades requested were not carried out until they pointed out the situation (occasionally several times) to the company representative. Since this friend is a trained architect, but no longer practising, he understands job site communication procedures. He also can appreciate job site conditions and workmanship.

Each lapse not only raises the question of how effectively contractors do the work, but also how well they communicate with their workers. Poor communications means a substantial cost as work and modifications may have to be done several times. As we all know, repair or alternation work can be substantially more costly to do once construction is completed.

In the visit to a job site in Colorado, I was surprised by the lack of understanding of basic building principles. In one detail, the basement was carefully caulked and sealed. However, the access hatches relied on holes in the floor to lift them - making one wonder why they bothered with the expense of caulking and sealing. The insulation in the house was apparently installed by the lowest bidder working on piecework. Four types of batt insulation were used and installed in such a sloppy manner that its effectiveness would be severely affected. It is worth adding that this was not a low-end, starter home, but an upper mid-range development with house prices in the mid $300,000 range for a 2,400-2,800 sq. ft. house.

Construction involves many different players. The contractor on the job site is like an orchestra conductor. When everyone is playing in tune, and from the same song sheet, the music is a delight. Imagine if the orchestra players were each to play their own tune, at their own tempo, using different song sheets. A recipe for dissonance and noise?

Now think about what happens on a construction site. Tasks have become so narrow and focussed that the average tradesperson doesn't have the understanding of building science fundamentals to realize the consequences of his or her actions. Each trade performs its own tasks, ignoring the interface with the other trades on the job site. Today's division of labour has become so specialized, and payments organized on a piecework basis, that there is little opportunity for real team work. Even if trades people do appreciate construction subtleties, it may be a case of "it's not my job."

On too many job sites, even if there are detailed plans or special details that have to be considered, there is no communication with those who are responsible for carrying out that work. We don't expect the orchestra to play in tune without a conductor. It should be the same on the construction site. It would be wise to make sure that enough direction is given to everyone on the site. This would mean not only a better job, but also more satisfied customers with confidence in the builder, fewer callbacks and a healthier bottom line.

Richard Kadulski,
Editor

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Tel: 604-689-1841 Fax: 604-689-1841
e-mail: solplan@direct.ca
Street address:
#204 - 1037 West Broadway
Vancouver, BC V6H 1E3

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Basement Walls That Dry

It is important to build basements that do not leak. Common moisture problems are water penetration through cracks in the basement walls and flooding as well a condensation of humid air on cold surfaces.

All basement construction has to assume that there is water in the ground.

Traditionally basements were the result of construction that needed to reach solid bearing below the frost line. Basements offered low cost unconditioned storage space. They were where coal and other fuels were usually stored and may have also been treated as cellars or cold storage spaces.

In recent years the basement has been brought "inside" the house - as additional living space. Although basements may not always be finished when first built, they should always be considered as part of the finished, fully conditioned space. This requires rethinking the way we design and build foundations.

We have learned to put more effort in construction above grade. Our houses now are built better, and are more energy efficient and durable. However, the way we build the foundations and basements has not changed substantially.

It is most important to design and build basements so they do not leak and cause problems. The most common moisture problems are water penetration through cracks in the basement walls and flooding. There are many ways basements can get wet. Water can get in through leaks in the construction and the floor, especially from a high water table. Another source of wetting is condensation of humid air on cold surfaces.

The consequences of wetting can be serious. Excessive water can lead to the growth of mould in the basement, which can cause health problems for the occupants. Water can also damage furniture and basement finishes, requiring their replacement.

The most important first step is to build in a way that will reduce water pressure against the foundation. This means not building an in-ground basement that is below the water table. It may seem like common sense, but I am amazed how frequently it is considered normal to build a basement floor that is at or even below the water table and then search for water proofing strategies. If the basement needs an active sump pump to keep it dry, it has been built wrong.

All basement construction has to start with the assumption that there will be water in the ground, so strategies to move water away from the foundation wall must be employed. Water diversion on the outside of the basement is most effective - using foundation drainage materials on the basement wall, good drainage at the base of the wall, and drainage under the house.

A recently completed study for CMHC done at the Alberta Home Heating Research facility looked at several interior basement finishing options. They wanted to answer the question: If water does enter, are there some basement wall systems that dry more quickly and safely than others? Walls that drain and dry easily might survive intermittent wetting. Sustained moisture levels of more than 20% in wood can start mould growth.

Ten different basement wall systems were tested for their drying capacity. The study also looked at different ways of finishing basement interiors.

The interior of the test house was kept at a constant 40 - 50% relative humidity and the air temperature at 20°C.

The study introduced a controlled leak behind each wall panel. In addition, the basement was flooded to a depth of approximately 4 inches. After each wetting, the panels were monitored for months to ascertain their drying characteristics.

Five variations of conventional wood-framed construction were tested: two steel stud and three proprietary systems.

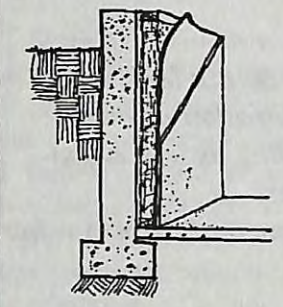
Drying of interior basement walls was slow in both the leak and the flood situations.

Overall, all of the proprietary wall systems worked better than the wood-framed or steel stud systems when subjected to both leaks and short term floods. The proprietary systems either did not absorb significant amounts of moisture or dried relatively rapidly after wetting.

The steel stud systems performed better than their wood-framed counterparts when subjected to a short term flood because steel studs cannot retain moisture. However, the stud cavities remained damp because water was retained by the insulation and polyethylene sheeting.

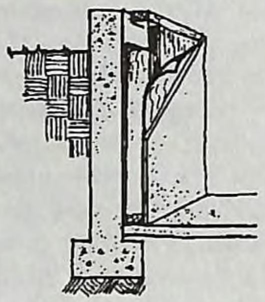
***Basement Walls that Dry** by Tom W Forest and Mark Y Ackerman, University of Alberta, for CMHC Research Division*

Walls Systems Tested

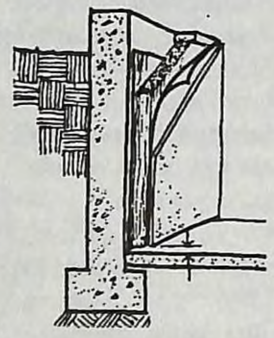


Standard Construction: painted gypsum board, 6 mil (0.15 mm) polyethylene vapour barrier, 2x4 framing and fibreglass batt insulation. The bottom plate sits on the concrete floor.

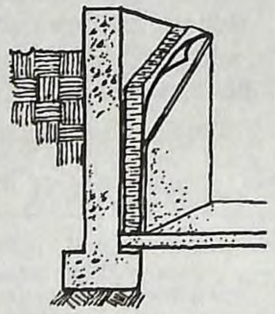
Improved Standard Construction: In addition to the standard construction configuration, has a 6 mil (0.15 mm) polyethylene sheet applied to the concrete wall up to grade level as a moisture barrier.



Improved Standard Construction: both versions of the above, with Densglas Gold (a water resistant drywall frequently used in commercial construction) rather than conventional drywall, with the bottom plate spaced off ¾" (19 mm) off the floor.



Steel stud frame, with Densglas Gold drywall on 2x4 steel studs with fibreglass batt insulation and 6 mil polyethylene vapour barrier and a 6 mil polyethylene moisture barrier against the concrete. The bottom plate is raised ¾" (19 mm) off the concrete floor. A second panel has framing is spaced off ¾" (19 mm) from concrete wall.



Proprietary Wall system: extruded polystyrene with vertical grooves intended to allow water to drain away from between the insulation and the concrete wall onto which it is applied, with Densglas Gold and 0.15 polyethylene vapour barrier.

Proprietary Wall system: Rigid fibreglass with a vinyl finish, no exterior moisture barrier.

Proprietary Wall system: Sprayed polyurethane insulation over a standard wood stud wall with Densglas Gold drywall.

None of the alternative wood-framed systems appeared superior in either of the wetting tests. With a controlled leak, the systems that had an external moisture barrier (i.e., plastic against the concrete wall) caused the water to flow down the wall, under the bottom plate and into the basement. These systems appeared to offer superior performance because the wood was protected from the leak by design. However, it was not possible to seal the panels perfectly, or was any real attempt made to do so. When the source of the moisture was a flood, the water found its way into all panels, no matter if a moisture barrier was present. Once in the panel, the moisture was trapped longer in those panels with a moisture barrier, because the barrier inhibited moisture removal.

During the controlled leak, two of the proprietary wall systems, extruded polystyrene and rigid fibreglass, appeared to shed moisture. Their performance was also superior during flooding. The rigid fibreglass drained very quickly and dried quickly. Extruded polystyrene and sprayed polyurethane initially did not absorb significant amounts of moisture. However, high levels of relative humidity remained for a long time in the cavities behind the extruded polystyrene, so mould growth could still occur.

Conditions were generally favourable to mould growth, but none occurred in any of the cavities. However, there was some minor darkening in the bottom plate of two of the wood framed panels. The lack of mould growth may be due to lack of spores that must be present to initiate growth.

Some wall systems seem to tolerate an occasional wall leak without significant wetting. However, standard or modified stud walls retained too much moisture to be safe during major wall leaks or flooding.

Cross Bridging

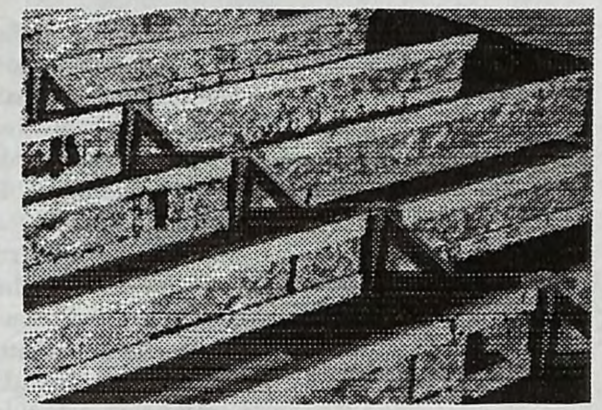
Cross bridging improves the performance and load-carrying capacity of conventional sawn lumber joist floors. However, less is known about the effect of cross bridging on wood-I floor joist systems. With the rapid growth in the use of prefabricated wood I-joists, and the tendency of builders to use conventional construction techniques for this product, it is important to understand how wood I-joist systems perform. Can the same type of bridging used with sawn lumber be used for wood I-joist floors? This was the question asked the Wood Science & Technology Centre at the University of New Brunswick.

The addition of cross bridging causes more joists to share any applied load, thus lowering the load carried by any one joist. Both static deflection and vibration level decrease with the addition of bridging in floors built with wood I-joists.

Full size panels of eight floor systems were tested for their deflection and vibration characteristics. The tests also looked at what happened if cross bridging was omitted. The wood I-joists were 302 mm (11 ⅞") deep with an oriented strandboard floor sheathing. Construction details largely followed National Building Code requirements.

The testing found that deflection and vibration decreased when bridging was added. Substantial reduction in deflection under a point load can be achieved by adding rows of bridging. Bridging was more effective in floors with close joist spacing (16" c/c) than with wide joist spacing (24" o/c). Increasing the bridging from one to two (equally spaced) rows led to a large reduction in floor deflection but only a small reduction in vibration. The entire system was substantially improved when a bottom lumber strap was used with the cross bridging. This was especially important for wide (24" o/c) joist spacing.

The effectiveness of cross bridging depends almost entirely on the quality of its connections to the joists. However, it is difficult to achieve good connections for cross bridging in the field. The problems are even more prominent for wood I-joists because of the limited nailing areas in the flanges. Improper nailing not only reduces the effectiveness of bridging, but also splits wood material causing potential weakening of the joists themselves.



The current requirement of using two 2¼" (57 mm) nails at each end of a cross bridging member was found adequate if properly installed. Any weak fastening or missing bridging may lead to a large reduction in load-carrying capacities of floors. However, using bottom strapping with cross bridging can minimize this reduction.

The cross bridging used in the test floors was made up of green 2"x2" (38 x 38 mm) dressed lumber to simulate field situations. The bridging was attached to the joists using two 2¼" spiral nails on each end. Nails were driven by hammer horizontally into the I-joist flanges. Testing was done within one week of fastening bridging to a floor.

Both static deflection and vibration level decrease by increasing the number of rows of bridging.

The addition of bottom lumber strapping leads to significant improvement in floor performance by lowering static deflection and acceleration levels. The presence of strapping also serves to overcome some of the problems associated with improper installation of cross bridging.

Use of Conventional Cross Bridging in Wood I-Joist Floors
for Canada Mortgage and Housing Corporation
by Wood Science and Technology Centre University of New Brunswick

Energy Efficiency Requirements in the UK Building Codes

By Mark Gorgolewski

The UK government has set out how the UK will attempt to meet its Kyoto target of a 12.5% savings in greenhouse gas emissions by 2010. Their program recognizes the need for higher energy efficiency performance standards for buildings, which are responsible for 46% of UK carbon dioxide emissions.

Following a lengthy review process with much industry involvement, the government has finally published a consultation paper that sets out proposals for changes to Part L of the Building Regulations which deals with energy efficiency. The aim of the proposals is to reduce carbon dioxide emissions from buildings by up to 25%.

The consultation paper contains specific proposals for changes that, if accepted, will be introduced immediately (coming into force in late 2001). Further improvements will be implemented 18 months later. Proposals for possible future changes in 2005 and 2007 are mentioned in the document for discussion purposes.

A significant change is to bring more work on existing buildings within the definition of "building work" in the Regulations. This recognizes the need to improve the energy efficiency of existing buildings. Thus, in future, changes such as replacing windows and upgrading boilers will have to meet the same requirements as for new buildings. Furthermore, work such as substantial alterations to cladding, will have to meet the new air-tightness and insulation requirements.

Existing and Proposed RSI-value requirements (W/m²K)

Element	Current Regs	Stage 1 (2001)		Stage 2 (2003)	
		Carbon efficient heating*	Other heating	Carbon efficient heating*	Other heating
Walls	0.45 *(12.6)*	0.35 *(16)*	0.31 *(18.2)*	0.30 *(18.8)*	0.27 *(21)*
Floors	0.45 *(12.6)*	0.30 *(18.8)*	0.27 *(21)*	0.25 *(22.7)*	0.22 *(25.8)*
Pitched roof - insul bet ceiling joists	0.25 *(22.7)*	0.20 *(28.5)*	0.18 *(31.5)*	0.16 *(35.4)*	0.16 *(35.4)*
Pitched roof - insul bet rafters	0.30 *(18.8)*	0.25 *(22.7)*	0.22 *(25.8)*	0.20 *(28.5)*	0.18 *(31.5)*
Flat roof	0.35 *(16)*	0.25 *(22.7)*	0.22 *(25.8)*	0.25 *(22.7)*	0.22 *(25.8)*
Windows	3.30 *(1.7)*	2.20 *(2.58)*	2.00 *(2.8)*	2.00 *(2.8)*	1.80 *(3.1)*

** The 'Carbon efficient heating' figures apply only when efficient gas or oil fired heating systems are to be used. For electric, solid fuel, or inefficient gas and oil heating, the lower U-value requirements in the 'Other heating' columns apply*

Bracketed numbers are Imperial R-value equivalents, rounded off

For new dwellings the main changes include:

- Significantly improved R-values, which will require considerably higher levels of insulation. These will be introduced in two stages: the first in late 2001 and the second 18 months later. The table shows the existing and proposed requirements.
- Higher insulation standards for dwellings with electric or poor efficiency gas and oil heating systems.
- A whole house "Carbon Index" as an alternative method of demonstrating compliance. This involves a calculation of predicted space and hot water fuel use.
- Use of effective thermal values.
- Certification of heating and hot water systems to show that they have been correctly installed and commissioned, and the provision of operating and maintenance instructions for users.
- A minimum number of energy efficient lights (such as compact fluorescent lamps without integral ballast) in each dwelling, and automatic controls for external lighting.
- A requirement for increased standards of detail design and site workmanship to improve real building performance and to reduce thermal bridging and improve air-tightness.

At this stage, the proposals do not include mandatory air-tightness testing of dwellings. Until recently in the UK there has been little attention paid to air-tightness, so average air change rates for new houses are about 9 to 10 ach @ 50 Pa. However, the proposals require that air-tightness be considered by the designer and builder, and either "Robust Details" will need to be adopted, or an air-infiltration pressure test carried out. The proposed air-tightness standard (10 m³/m²/hr @ 50 Pa) is not very demanding, but in some cases more attention to detailing and construction practice will be needed. It is likely that air-tightness testing will become mandatory for dwellings within 4 to 5 years, and more demanding targets will be set.

The Building Research Establishment is working with representatives from the construction industry to develop a set of "Robust Details" for residential construction that will be published as an advisory document. Use of these details will be seen as satisfying requirements for thermal bridge detailing and air-tightness. Other, non-standard, details will need to demonstrate compliance by calculation and testing.

Similar improvements are proposed for non-residential construction. Additional changes include:

- Mandatory air-tightness testing for all buildings with a floor area more than 1,000 m².
- Performance standards to avoid solar overheating by appropriate window size and placement, and the use of shading devices.
- Improved performance standards for mechanical systems.
- Improved performance standards for lights.
- New performance standards for air-conditioned or mechanically ventilated buildings more than 200 m² in floor area. For offices this will be based on a "Carbon Performance Index". The initial compliance levels will be set at current "typical" performance, and will be aimed at eliminating the worst current practices.
- Requirements for checking the "as built" performance of buildings more than 1,000 m² in area to ensure they match design specifications. This may include surveys with infrared cameras to show thermal bridging, or certification by qualified installers. There are also requirements for remedial action in the event of failure.
- Certification of commissioning procedures for HVAC in line with CIBSE codes of good practice.
- Provision of an operation, service and maintenance log book, which includes information on the maintenance history and how to operate the building.
- Sub-meters to permit measurement of energy use.

Overall, these are considerable improvements over the current requirements. It is likely that these proposals, along with other initiatives, will result in a move away from the ubiquitous masonry cavity wall construction. A variety of alternative construction methods such as timber and steel framing, structural insulated panels, insulated concrete forms, externally insulated masonry and others may become more attractive.

However, there is still much ambiguity about how the proposals will be implemented. There are a number of issues that are disappointing or still unclear that will make a significant difference in the impact of the final proposals. These include:

- Large tradeoffs are still allowed between envelope elements and the heating system. Thus, low R-values are allowed if these are compensated for by better standards in other elements or by a higher efficiency heating system.
- Low R-values are allowed in return for smaller windows. This will tend to lead to increased electrical use for lighting and reduce passive solar gains. The energy performance of many dwellings could worsen if the glazing ratio is reduced from 25% to 15% and the wall R-value is increased to 12.
- As currently set out, the "combined" U-value calculation method is unclear. It is important that realistic values be used for the proportion of thermal bridging area in an element. The example calculation for a wood-frame wall in the consultation paper assumes that the framing forms only 9.5% of the wall area. This is unrealistic as it does not include the wall plates, cripple studs and un-insulated first floor areas. UK research suggests 15% is more realistic, while the Canadian Model National Energy Code uses 19%.
- The air-tightness standards are not very demanding and represent average air infiltration standards for new UK housing. Thus, in the short term the proposals are unlikely to lead to a serious reappraisal of construction practice to improve air-tightness, which would lead to the inclusion of an unbroken air barrier next to the insulation as is required in Canada. It is likely that, for the time being, many poor practices, such as plasterboard on dabs without any effective air barrier and cold air penetrating to the warm side of the insulation will continue.

The consultation document and other supporting documents are available on the Internet at:

www.construction.detr.gov.uk/consult/eep/index.htm

Mark Gorgoloweski is a registered architect in the UK with extensive experience with energy efficiency in the residential sector.

Health Canada Compares Occupants' Health in New R-2000 and Conventional Houses

Much has been said recently about healthy home environments. For many years anecdotal evidence has been collected about the improved health that residents in R-2000 homes have experienced. CMHC has been promoting healthy home environment ideas through their Healthy House initiative. But is there scientific evidence behind claims that R-2000 homes are healthier for their occupants?

Health Canada has been studying people's health before and after moving into new R-2000 houses and similar new conventional (non-R-2000) houses. The study was begun in 1996, and includes 312 people living in 105 houses in New Brunswick and Nova Scotia. The survey concentrated on New Brunswick and Nova Scotia due to the general concern with air quality problems in that region, and because of the large number of R-2000 houses being built there. The research team included medical and health professionals, specialists in data analysis, and building scientists.

Preliminary results show that people who moved into certified R-2000 houses found that their health improved more that those who moved into conventional houses.

The R-2000 Program certifies houses that meet strict criteria for energy efficiency, ventilation, and construction practices. Builders are specially trained and certified. The plans and construction of each house are evaluated and inspected by trained, licensed professionals. Houses are individually tested for airtightness, and must be certified to be R-2000 houses

When the program began in 1982, it was mainly concerned with energy conservation, but has evolved to include requirements for materials and water conservation, indoor air quality, and a healthier, more comfortable living environment.

For information on the R-2000 Program, contact your local program office, or call 1-800-387-2000

> ☛ *94% of R-2000 home occupants said the indoor air quality was better in their new homes compared with 77% in conventional houses.*
>
> ☛ *56% of R-2000 home occupants reported health improvements, compared with only 32% in conventional houses (and 10% reported a deterioration in health).*

Features include:

- increased insulation and airtightness
- increased energy efficiency
- no spillage-susceptible combustion equipment
- fresh air (mechanical ventilation) to all rooms
- environmentally-friendly products, and
- healthy building materials and finishes.

These features are specifically intended to improve indoor air quality and health. Measurements of indoor pollutants such as formaldehyde and volatile organic compounds have shown that pollutant levels are lower in R-2000 houses as compared with similar conventional houses, but until now no direct study has compared the health of people in the two.

Health Canada administered a telephone questionnaire to one member of each household before they moved into their new house. The questionnaire asked about characteristics of the house they were moving from, including perceptions of its indoor air quality, the demographics, general level of health, medications taken by of each member of the household, and whether and to what extent each member of the household experienced each of thirteen symptoms. The symptoms selected were those with a known relationship to poor indoor air quality. These included headache, fatigue, dry or itchy skin, runny nose, blocked nose, sneezing, throat irritation, cough, wheeze, nausea, diarrhea, difficulty concentrating, and irritability, along with a couple of "control" symptoms not normally affected by air quality.

The number of people with allergies and chronic bronchitis are almost equal for both R-2000 and conventional houses. However, only half as many of the R-2000 people smoke, and there were about half as many R-2000 homeowners with asthma, or using regular medication for breathing problems or allergies. The numbers of smokers may suggest a higher level of concern for health in people who moved into R-2000 houses, while the numbers for asthma and medication may show that they were healthier initially. Since the survey was looking at changes in health due to environment, the differences in initial health were not considered relevant.

One year after moving into the new house, the same respondent was contacted for a follow-up questionnaire. The follow-up repeated most of the questions in the original questionnaire.

For all thirteen symptoms, the improvement in R-2000 houses was greater than in the conventional ones. Twice as many occupants of conventional houses found them too dusty or too humid compared with R-2000 houses, and significantly more found their conventional houses too dry or drafty. When asked whether they felt that the indoor air quality was better in their new house than in their old one, 94% of R-2000 occupants said yes, compared with 77% in non-R-2000 houses. When asked whether their general health had improved or deteriorated since moving to their new houses, 32% of conventional house occupants reported improvement and 10% reported deterioration. In the R-2000 houses, 56% reported improvement and none reported deterioration.

This first direct study of the health effect of R-2000 houses provides a clear indication that the R-2000 Program's focus on improving indoor air quality does result in better occupant health. These results are preliminary. The sample size is small, and represents only one geographic region. But the results strongly show that people who moved into R-2000 houses found that their health improved more than those who moved into conventional ones. The results are also consistent with occupants' perceptions of their indoor air quality. The difference has been recognized as statistically significant.

A second phase of the study will include more houses. Ongoing work will also be looking at the air quality in twenty of the houses in the original survey.

R-2000 and conventional houses with the most significant improvement and deterioration in health are being looked at in more detail. The study will include measurements of air change rates, mould species and counts, allergens, formaldehyde, and volatile organic compounds. When the results are analyzed, they may provide specific information on why some houses are healthier than others. This should lead to more improvements in the health characteristics of both R-2000 and conventional houses.

Which are Better: Plastic or Copper Pipes?

Plastic-plumbing manufacturers have waged a public relations war against copper pipe claiming that "aggressive," (i.e., acidic) water, can corrode copper. Now the copper manufacturers have counterattacked by pointing to a study that claims copper pipes have much less biofilm (slime) than polybutylene plastic.

The report could be important because polybutylene pipes are widely used around the world. Biofilm harbours the infamous e-coli bacteria which can cause kidney disease and even death. However, it will only muddy the waters in North America, where biofilm-resistant chlorinated polyvinyl chloride (CPVC) is used.

The study (done in England) found that after being submerged in potable water for seven days at 50°F, virtually no biofilm appeared on the copper pipes, but 90% of the polybutylene surfaces and 80% of the steel surfaces were covered. E-coli concentrations on copper pipes were less than one-hundredth of those found on steel or polybutylene. Tests at other water temperatures, gave similar results.

While copper piping is still used in 80% of domestic water installations, CPVC pipes are gaining ground. Here's a look at the pros and cons of each.

Copper	CPVC
Advantages • withstands high water pressure • inhibits bacterial growth • won't get brittle in cold temperatures • unlikely to melt in a fire • withstands wide temperature swings	**Advantages** • won't pit or corrode from acidic water • quiet • installs quickly
Disadvantages • corrodes when subjected to acidic water	**Disadvantages** • subject to ultraviolet light deterioration if used outside • has limitations on use at higher temperatures

Letters to the Editor

Re: Energy Answers, Solplan Review No. 94, September 2000.

Our compliments to Rob Dumont for the insightful review of Residential Ventilation. The summary was the first clear common sense return to basics we've read in the last 15 years.

From a Canadian research community preoccupied with building envelope issues, the mechanical insight is especially refreshing. Points that we are especially happy to hear Rob mention include:

1. **Ventilation Flow Rates**: You say systems must be continuous. We agree and think most people overlook the power of small systems. At only 15 cfm, the rate recommended for one person, this volume adds up to a significant 1620 pounds of fresh air each day. Your personal daily requirement alone would be enough to bend the rear springs if you had to haul that home on your ½ ton pick up.
2. **Ventilation Exhaust Effectiveness**: You mention that exhaust must be drawn from the kitchen and bathroom. We think that you will agree one cannot efficiently improve the overall air quality of a home unless we exhaust "spent" air, not just any air. Exhaust of the relatively clean air from the return air system of a forced air-heated house is, I think, both ineffective and wasteful. Effective and efficient ventilation requires that we differentiate between return air which is fresh enough to reuse and exhaust air which needs to be removed.
3. **Equipment longevity**: Wow! At last someone cares. Yes, our HVAC industry can supply a transparent 100,000 hour system. But you must ask for it, and be prepared to pay more than the current price to which HVAC manufacturers and installers have been reduced.

In future articles we hope Rob may offer an opinion on the following contentious topics:

"Fresh Air Effectiveness" How effectively does the fresh ventilation air we draw into the house improve the air inside before we exhaust it?

Is it possible to compare the following HRV systems in terms of their effectiveness in delivery of fresh air to our *"Breathing Zone"* (at head level which one would think is the prime purpose for ventilation)?

- a standard fan driven HRV when the fresh air:
  a) is independently distributed
  b) distributed via a forced air furnace or
  c) when the HRV is double plugged (with both exhaust and supply ducts are connected to the return of a forced air heating system).
- The efficiency and effectiveness of fanless HRV's when:
  a) the HRV module is built into the forced air heating appliance and
  b) when an independent fanless HRV is installed with a forced air heating system.

Thanks Rob. I believe that it is about time we all seriously consider your comments and think Ventilation Effectiveness and Energy Efficiency when choosing a system.

David Hill
Eneready Products Ltd.
Burnaby, BC.

Re: Mould, Moisture and Mildew in Attics (Solplan Review No. 94, September 2000)

Thank you for the Solplan Review. Every issue is intensely interesting for me and of real use to my Building Inspection Service. Keep up the good work.

Tony Wood's article touched on several building faults I often find. In particular, his reference to earthen floored crawl spaces reminded me of a problem I saw some months ago. In some crawl spaces, uneven ground is covered with heavy poly sheeting and topped with gravel or sand. What can happen is that big, poly-lined hollows in the uneven ground fill with water during winter. Since the water can't drain out the bottom, these gravel-filled ponds remain moist and dank all summer (a great environment for mould and fungus).

The fix I suggested was to slash the poly in the hollows, even out the gravel, then install a new poly sheet with gravel on top.

Andrew Barker
Barker Building & Consulting Ltd.

Innovations in Energy Efficient Furnaces

Standard gas furnaces fire on and off at full capacity when heat is called for. High efficiency furnaces have sealed combustion to maximize energy recovery from natural gas and often have multi-stage firing- if only some of the furnace's capacity is needed, the gas is burned at only a portion of the total capacity. They also have two speed blowers to vary airflow. However, most furnaces still use inefficient motors.

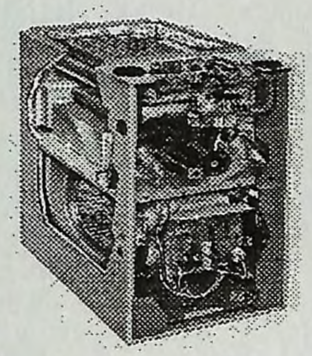
Motor efficiency is significant because furnaces are increasingly being integrated with the ventilation system and fans are run continuously. An inefficient blower motor, running continuously, can easily consume 800 or more watts of electricity per hour. This translates into many hundreds of dollars per year in electrical consumption.

Energy efficient fan motors such as electronically commutated motors (ECMs) have been available for more than seven years. These have variable speeds, with a power draw proportional to speed, so at low speeds power consumption is also low. Nevertheless, manufacturers have been reluctant to take advantage of ECM motors, no doubt a result of the constant drive for the lowest first cost.

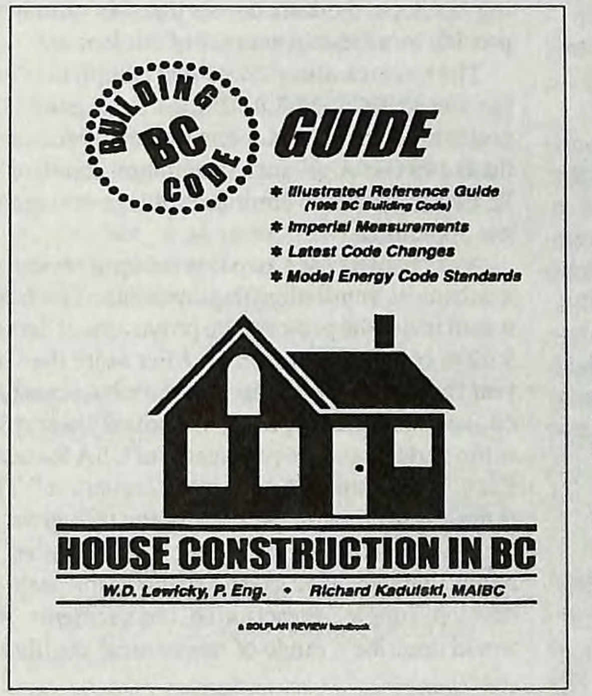
I know of homeowner complaints about high electrical consumption by **Lennox CompleteHeat**, whose efficient natural gas combustion is offset by an inefficient blower motor. The continuously running blower motor can consume as much power as needed to heat the entire house.

The drive for better energy efficiency and the availability of alternatives are two reasons why the proposed R-2000 technical requirements will require the use of ECM furnace motors.

One unit now on the market is the **Rheem 90 Plus Modulating** gas furnace. This sealed combustion gas furnace has a modulating gas valve and burner for optimum gas consumption and an AFUE rating of 94%. The furnace uses a modulating blower motor that reduces electrical consumption. The manufacturer claims that at low speed (40% rate) it consumes only 120 watts of electricity, while at full speed it uses 450 watts. This represents an annual saving of more than 2,600 kWh in electrical use over the heating season compared to their high efficiency Standard 90 Plus model which has a 600-watt motor. At an electrical rate of $0.09/kWh, the efficiency of the blower motor alone would represent an annual saving of $234, a short term payback.



The unit has a stainless steel heat exchanger with a limited lifetime warranty. Rheem also offers an extended ten-year warranty and service coverage.



A Simplified, Illustrated Guide to Residential Construction

House Construction in BC

by W.D. Lewicky, P. Eng. and Richard Kadulski, MAIBC

The illustrated guide to the 1998 BC Building Code explains Part 9 of the code as it applies to residential construction. This reference guide uses imperial measurements and explains code requirements with sketches where appropriate. The guide highlights the new code changes that came into effect on December 18, 1998.

Editorial comments are made to show where better practice can avoid problems, especially with building envelope detailing.

Also includes highlights of Model National Energy Code for Houses requirements for BC. (These standards are currently optional).

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Technical Research Committee News

Canadian Home Builders' Association

Mechanical Ventilation

Construction materials and techniques have changed significantly over the last several decades, resulting in tighter houses with low outdoor air leakage rates. Problems have arisen with interior condensation and mould growth, spillage of carbon monoxide and other combustion products, and stale air. That is why the ventilation requirements in the National Building Code (NBC) have became more specific. The 1995 NBC includes both prescriptive and performance-based requirements.

Soon after the code was adopted, difficulties were reported in complying with the prescriptive ventilation system requirements in NBC Section 9.32. Performance testing is not usually done on houses, and in some provinces there is a lack of technical skill in the industry that leads to installation problems. Installers have found the prescriptive approach:

- ☞ too complicated to understand
- ☞ fails to protect the furnace heat exchanger from cold air
- ☞ does not prevent spillage
- ☞ does not ensure an adequate supply of outdoor air adequately distributed where needed in the house
- ☞ can mean incorrect duct sizing leading to incorrect air flows

CMHC did a study to look at 1995 NBC ventilation systems in new houses in the Prairies, the Maritimes and the Yukon. As well, houses built to the 1993 Ontario Building Code (OBC) were tested. The study confirmed that there are problems in the design, installation, commissioning, and approval of ventilation systems in new Canadian homes. None of the houses fully complied with Section 9.32 and no houses had properly functioning ventilation systems nor had the expected system maintenance.

What were the problems?

Spillage was a common problem in tight Prairie houses, and gas inspectors frequently "red tagged" furnaces. Systems could be code compliant, but still not achieve the desired performance. Thirty-one of 38 study houses were predicted to be depressurized by at least 5 Pa by operating the dryer, range hood and principal exhaust system. One had a negative pressure as high as 148 Pa.

Another serious problem reported was very high flow of outdoor air through outdoor air ducts connected to the return air plenums of forced air heating systems. The negative pressure in the plenums in these cases was much higher than had been assumed in developing the outdoor air duct sizing table in the Code. These high air flows threaten to shorten the life of the furnace heat exchangers. This is a flaw in the Code rather than in its application.

The 1993 Ontario Building Code has a prescriptive approach that permits unbalanced ventilation (i.e., "exhaust-only") where there are no spillage-susceptible heating appliances. As well, in this approach, the OBC does not require an outdoor air intake, which eliminates the concern about unconditioned outdoor air passing over the furnace heat exchanger.

However, there are no provisions to distribute outdoor air, so the exhaust-only system cannot be relied on to distribute outdoor air. Also, because it relies on leakage of outdoor air through the building envelope, there are doubts that this system will provide an adequate amount of outdoor air.

The research also showed that compliance with the 1995 NBC 9.32.3.8. (Protection Against Depressurization) does not ensure compliance with the B 149 Gas Appliance Installation standard's 5 Pa depressurization limit for spillage-susceptible gas appliances.

As a result a task group was set up to review the mechanical ventilation requirements. The intent was to revise the prescriptive provisions of Section 9.32 to correct the problems. After more than one year the task group has failed to reach a consensus on acceptable prescriptively-described alternatives to the performance requirements of CSA Standard F326, "Residential Mechanical Ventilation." This is not a reflection on the work of the task group or the good intentions of its members. Rather, it seems that they were given an impossible task - to develop simple, prescriptive requirements that would describe a range of mechanical ventilation systems that can be used in any new house in Canada and that will -

- be understood and applied by home builders and mechanical contractors with no special training
- provide an adequate supply of outdoor air
- distribute that air where needed in the house
- not depressurize the house more severely than can be tolerated by the combustion equipment in the house
- not result in the temperature of the air flowing over a furnace heat exchanger being lower than recommended by the furnace manufacturer.

Because of the difficulty in achieving a consensus and the low probability it could be accomplished in the future, the technical support staff has recommended abandoning the search for prescriptive alternatives and is calling for all houses to incorporate mechanical ventilation systems complying with CSA F326. The practical effect of requiring compliance with F326 would be that such systems be designed for each house (or at least each house model) by someone trained and certified by HRAI.

It is clear from the research that inspection authorities, be they municipal building officials or gas inspectors, have not been effective at enforcing code requirements. This suggests that either codes will need to be made easier to follow, or inspection of new houses requires a stronger commitment to adequate staffing and staff training.

Builders should require ventilation and heating contractors to commission installed equipment, including depressurization testing where required.

In the short term, modifications to existing design, practice, and installation can alleviate most of the problems identified, especially those involving combustion safety.

The Technical Research Committee (TRC) is the industry's forum for the exchange of information on research and development in the housing sector.

Canadian Home Builders' Association,
Suite 500, 150 Laurier Ave. West, Ottawa, Ont. K1P 5J4
Tel: (613) 230-3060
Fax: (613) 232-8214
e-mail: chba@chba.ca

Durability of Wood Frame Construction

The Canadian Wood Council is developing a publication that covers moisture and wood frame construction. It will provide theoretical information on moisture infiltration as well specific details that can be used to prevent moisture problems in wood buildings.

Sound Transfer Through Construction Assemblies

Changing population demographics means that we have to revisit construction practices to meet consumer expectations. More older people are moving from single family homes to multiple dwelling "condos." Many of these are older persons who expect the same level of privacy they were used to in single detached units.

Achieving acoustic privacy need not be a major problem if attention is given to the construction details used in common walls. These should be built as airtight (if not more so) than exterior walls. Too often, these details are overlooked.

Source Water Problems Continue

The tragedy in Ontario last summer focussed attention on our water supply system. More diligent testing and examination are being done everywhere. The news is that problems are lurking everywhere. Ontario inspectors have found that 148 of the 281 water treatment plants tested since June 2000 have problems, including faulty chlorination equipment, insufficient water testing and inadequate training for operators. (There are 630 plants across the province of Ontario)

60% of the water wells on government owned land in Ontario have tested positive for E. coli, parasites or excessive minerals.

The Quebec government announced that 90 municipalities in the province have chronic problems with water quality.

Dozens of communities in Newfoundland have been ordered to boil their drinking water because of the uneven application of water quality standards.

Residents in southern Saskatchewan have boiled their tap water or drank bottled water since floods ravaged the area.

Water Treatment Professional Certification

Certification is now required in California. As of July 1, 2000 anyone who provides home improvement goods and services, including water treatment or water softening systems in an existing house, is required to pass an open book test to receive certification.

Ventilation in Existing Houses

by Richard Kadulski

When we consider indoor air quality, most of the time our focus is on new construction. When we build from scratch, it's as if we are dealing with a blank piece of paper. Dealing with healthy materials and proper ventilation strategies to ensure good indoor air quality is easy because all options are still open. Unfortunately, most of the housing stock that will be used for the next generation or two has already been built. People suffering ill effects from their home environment don't always have the means to make drastic changes: Building from scratch is not often an option, because owners either don't have the means to build new, or don't want to be uprooted from their community. Also, an aging population means it is also better to remedy existing buildings rather than force residents to move out.

Some simple steps can be taken to improve the home environment and indoor air quality of a standard home without resorting to drastic measures. To make my point, I'd like to use an example I had to deal with in North Vancouver, BC.

The 1200 square foot bungalow on a basement half a storey into the ground was built around 1960. It is a typical design for the era, and examples like it can be found throughout North America. The house has two fireplaces on an exterior wall, one in the living on the main floor, and one in the basement. Both fireplaces have been equipped with gas logs, but only one is used occasionally. The windows are all single glazed, with either wood frame casements or aluminum frame sliders - none are airtight. Despite the lack of airtightness, the relatively mild climate and the occupants' insistence on keeping all windows closed meant that there was very little air change in the house.

The occupants are an old couple. As often happens with aging, people start to lose control over their bodily functions. Incontinence is a fact - and the reason many seniors' homes have an unpleasant odour. In addition, because of moving less, being comfortable means keeping indoor temperatures higher and windows shut, reducing natural ventilation and drafts. The result is higher levels of stale air. Smells are bottled up within the house, creating an unpleasant environment. This was the condition in the North Vancouver house some six years ago. When you entered the house, there was a noticeable, unpleasant odour. But the house was not airtight.

I installed a quiet Panasonic bathroom fan vented to the exterior. It was set up with 24-hour clock timer control, but programmed to operate continuously. Because the house was not airtight, depressurization was not an issue. Within a day, the results were obvious. The indoor air was fresh.

Yes, there may be an energy penalty with the exhaust only system. However, at a continuous 50-cfm air flow, the total volumes exchanged are relatively small, and the superior indoor air quality more than compensates for the price of the energy used.

This is an example of a simple solution to a serious indoor air quality problem. It may not be adequate in all cases, but it shows how simple a first step can be. When considering this type of solution to indoor air quality, make sure that the exhaust fan will not create enough negative pressure to affect the venting of combustion appliances such as fuel fired water heaters, furnaces, or fireplaces.

This example points out that costly diagnostic testing is not always necessary where there are concerns about indoor air quality. A functional mechanical ventilation strategy might well be the solution to most of the problems.

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Bathroom and Kitchen Fans

Bath and kitchen fans are an important part of a home's ventilation system. They remove odours and moisture. Squirrel cage blower fans generally do a better job of moving air than impeller (propeller type) fans.

Research has shown that many houses have exhaust fans that:

- are too noisy
- move very little air
- are not energy efficient
- may cause backdrafting of combustion appliances
- use high-wattage lighting

When selecting a fan, always choose the quietest, most energy-efficient fan in the size range required. Look for a unit with replaceable parts and permanent lubrication. A fan suitable for continued use is preferable. Be prepared to pay more for a quality fan.

Bathroom fans

A normal bathroom needs a good-quality quiet fan that draws 25 L/s (50cfm). The best fans will have a sound rating of 0.5 sones or less and consume about 20 watts. (Typical older units may have a sound rating of 4 sones and use 80 watts).

Kitchen fans

A kitchen range hood must move more air - about 50 to 140 L/s (100 to 300 cfm). The most useful units have a low noise rating, an energy-efficient fan, fluorescent lighting, sound insulation, anti-vibration mounts and duct connections.

Product ratings, for fans and heat recovery ventilators, are available from the Home Ventilation Institute.

Tel.: (847) 394-0150
Fax: (847) 253-0088

The institute's product directory is also accessible on line at *www.hvi.org*

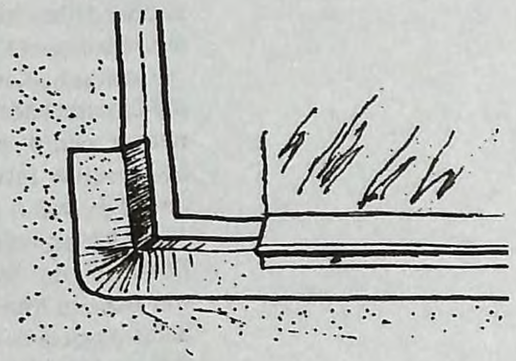
CMHC has produced a fact sheet called About Your House: The Importance of Bathroom and Kitchen Fans that can be downloaded from CMHC's web site at www.cmhc-schl.gc.ca

Flexible Flashing:
DuPont's Tyvek Flex Wrap

The purpose of any flashing is to deflect water toward the exterior of a wall. However, difficult shapes and details are often hard to flash. The most vulnerable locations are doors and windows, which will not act to expectation if not flashed properly due to damage by infiltrating water.

DuPont has introduced a new flashing product called Tyvek Flex Wrap. What makes this product so interesting is that it directly tackles one of the most challenging flashing details in construction - the three-dimensional corner, such as at the corner of window sills. Protection against water infiltration is provided by the mouldable, easy to install, three-dimensional flashing system that only uses one material and fits most windows.

Flex Wrap is a sandwich material made with Tyvek, an elastic waterproof membrane, a polyolefin film and a highly adhesive, self-sealing butyl substrate (similar to the widely used peel and stick). The butyl resists water penetration from fasteners as it seals itself around the nail. A dual release paper allows for easy handling on windy days.



Tyvek Flex Wrap can be moulded to to fully cover bottom window corners and most any shape window opening. The product's flexibility makes it easy to install in tough flashing areas, eliminating the need to cut many pieces for specific window shapes and sizes. On difficult shapes such as arch windows, a single piece can be stretched to conform to the arch, eliminating the many steps and guesswork involved in traditionally flashing arch windows.

TyvekFlex Wrap is designed for use over a wide range of temperatures.

The product will be launched in the new year, and should be available at local distributors by February, 2001.

Energy Answers

Rob Dumont

How bad are the natural gas price increases?

Natural gas prices are rising dramatically in North America. "Consumers will probably pay [about] 50% more for natural gas at their home," says Bill Gwozd, manager of gas services at Calgary energy consultant Ziff Energy. This is corroborated by Enbridge Consumers Gas, an Ontario utility, which says on its Web site that its typical residential customer will face a rate increase of 45% compared with a year ago. Some utilities with stored gas, or long range price contracts, can probably buffer the price increases in the short run. For example, in Saskatchewan the gas utility asked for only 27% more in its recent rate application.

Can homeowners do anything, in a cost-effective way, to reduce natural gas consumption?

Readers of Solplan Review have heard this message before, but the simple answer is yes. Here's a quote from a respected NRCan publication called Keeping the Heat In: "Energy efficiency is one of the best investments you can make today, paying tax-free dividends immediately in the form of lower heating costs." The booklet goes on to state that "home insulation is better (emphasis added) than just about any other low-risk, long-term investment you can make."

Currently, low-risk, long-term investments (GICs and bonds) generally pay about a 5 to 6% rate of return. Most carefully selected energy conservation investments will provide a higher rate of return.

In 1985 an interesting study (ENERGY DEMO: Home Energy Saving Demonstration Program) was done in Manitoba by Unies Ltd. and Appin Solar Associates on a variety of energy retrofits that could be done on houses. They found seven major items could be done to save energy for space heating. Ranked by cost effectiveness, they are:

1. Sealing against air leaks. "The relative cost-effectiveness of air leakage sealing retrofits was predicted to be very good, especially if the work was done by the owner," concluded the study. Holes exist all over the building envelope: up in the attic, in the walls, at the floor joists, in the basement, at windows and doors. In some of the 83 houses studied, however, the houses were sufficiently tight that no air sealing was recommended. It is very important to ensure that the house has adequate, but not excessive, ventilation.

2. Insulating un-insulated exterior walls. Houses built before 1940 generally had little or no insulation in the exterior walls, and it is usually cost-effective to blow insulation into the wall cavities of these houses. Sometimes it can be done from the basement or more commonly, by drilling holes through the walls in the house on either the inside or outside.

3. Insulating un-insulated basement walls. Bare concrete is a very poor insulator. Besides saving energy, insulation will improve the comfort levels in the basement.

4. Add insulation to the attics and ceilings of houses. If the attic is accessible, this can be very cost effective. Generally one would want at least about R40 insulation which is roughly the equivalent of about 12 inches of glass fiber insulation or cellulose fibre. It is important to do the air sealing in the attic before adding insulation. More insulation makes the attic colder (which is desirable) but also more prone to moisture problems if the holes through the ceiling leading into the attic are not air sealed. Holes allow moist, warm air to enter the attic space and condense or freeze onto the underside of the roof sheathing

5. Upgrading the heating system. Newer condensing furnaces are widely available, and these have Annual Fuel Utilization Efficiency (AFUE) values in the range of 90 to 96% efficiency. Older natural gas furnaces have comparable efficiencies in the range of 50 to 65%. Thus, this measure alone could cut space heating consumption dramatically. Upgrading to condensing furnaces, which have the highest efficiency, is very important. An important thing to watch out for is to make sure the furnace is not oversized for the heating demand for the building, and that the existing ductwork is adequate for the airflows of the new furnace. An analysis of previous gas bills for the house can give the furnace installer a good idea of the proper size of the furnace required.

6. Window upgrading. In general it is very expensive to save energy by replacing existing windows unless the windows are physically deteriorated. To quote from the study: "The relative cost-effectiveness of replacing double-glazed windows with new triple-glazed units was extremely poor." There is a technique of adding a third pane of glass to windows which is relatively cost effective. Another technique is to add a vinyl sheet on the inside of the window. Several brands of retrofit kits are available. These are do-it-yourself products and do not have the longevity of an additional piece of glass. Another benefit of adding a third pane of glass, sealed low-e glass units or plastic is a much warmer surface temperatures on the inside surface of the glass and fewer incidences of condensation.

7. Door retrofits. Replacing an existing door with a new door generally tends to have a very long energy payback period; however, if the existing door is beyond repair, the extra cost to go to an insulated door is relatively small. Sometimes the major problem with existing doors is air leakage around the door because of warping. Putting a new weather stripping on the door can be quite cost effective.

At the Saskatchewan Research Council we are starting a demonstration program for CMHC in which six Saskatoon houses will be retrofitted for improvements in energy efficiency. The houses range from a leaky 1911 house at one extreme to a 1986 house with near R-2000 performance. The houses will all have to achieve a 40% reduction in total energy consumption through retrofitting. We will keep you posted on the progress.

BC's *Building Envelope Professional* Program Struck Down in Court

Because of the building envelope failures in recent years, the architectural and engineering professions in British Columbia developed the *Building Envelope Professional* (BEP) designation. This was administered by a joint Building Envelope Qualifications Committee of the Architectural Institute of British Columbia (AIBC) and the Association of Professional Engineers and Geoscientists of British Columbia (APEGBC). It was also the professionals' response to a recommendation of the Barrett Commission.

The Committee established a process for evaluation and accreditation of persons offering advice on building envelopes for new and existing projects. Consisting of both architects and engineers with substantial building envelope expertise, the Committee evaluated the training and experience of professional engineers and architects who offered services in design review and inspections of building envelopes. Those architects and engineers who met the Committee's standard of competence received the designation of *Building Envelope Professional* (BEP).

The Supreme Court of BC struck down the joint Building Envelope Qualifications Committee on November 10, 2000. The court action was initiated by an engineer who had been denied accreditation.

The Court held that the AIBC and APEGBC lacked legislative authority to establish this Committee. Because of this judgment, the Committee has been dismantled and a formal credential evaluation process is no longer in operation. With the Court's decision that all previous BEP designations are invalid (a total of 46 before the Court ruling), the list of accredited Building Envelope Professionals is no longer available to the public.

The future of building envelope accreditation has yet to be determined. Before this ruling, the City of Vancouver was one of seven jurisdictions to announce that only those professionals carrying the BEP designation could satisfy the building envelope requirements of those municipalities on applicable projects (which was anything larger than a duplex). The AIBC and APEGBC met recently with the City of Vancouver to explore alternate methods for ensuring that qualified professional attention is given to design and site review on all new and existing projects.

In the meantime, the AIBC will continue delivery of its Building Envelope Education Program (BEEP). The program was established in 1997, and will be expanded to encompass new technologies and other applicable elements as continued research identifies opportunities for improved practices.

NRC·CNRC

Public Review of National Codes Objectives

By Frank Lohmann

The National Building Code, the National Fire Code and the National Plumbing Code are being converted to an objective-based form. As part of this process, the standing committees of the Canadian Commission on Building and Fire Codes (CCBFC) have devoted most of their efforts over the last three years to conducting a comprehensive analysis of the three codes. In this analysis, the specific intent of each code requirement and the overall code objective(s) it is related to have been identified.

The analysis has made possible clear articulation of the objectives addressed by each of the codes. For example, although most of the requirements of the National Building Code (NBC) are related to safety, health and accessibility, some are not, as the NBC clearly addresses other issues.

After reviewing the objectives that emerged from the analysis of each code, the Commission has proposed that objectives concerned with issues other than Safety, Health and Accessibility be classified in two different categories:

1. Those that could be eliminated before the publication of the next editions of the codes in 2003, and
2. Those that would remain in the next editions but would then be examined in greater depth to determine whether they should continue to be included in the code.

The public review on issues related to the three codes will be co-ordinated with the provinces and territories so that those issues related to provincial/territorial variations are reviewed at the same time.

Two public review processes have been scheduled. The first, which started October 15 and finishes January 15, will deal with the confirmation of the objectives of the codes and the proposed format for objective-based versions of the codes. The next public review, scheduled for mid-2002, will deal with the proposed technical changes to the 1995 codes and the then-completed objective-based versions of the codes (with 1995 content)

During this fall's review the Commission is seeking users' views on five issues related to the move to objective-based versions of the codes:

- ☞ The identification of the objectives of each code that have emerged from the analysis described above
- ☞ The proposed structure of the new codes
- ☞ The decision to move to objective-based codes
- ☞ The preparations required for implementation of objective-based codes
- ☞ A proposed change to a three-year code cycle.

An information package has been produced for the consultations, and will be distributed upon request. As well, seminars will be held across the country to explain the Commission's proposals for an objective-based format and for the objectives and structure of the new codes.

The consultations will be organized jointly with the provinces and territories, some of which have their own codes based on the national codes. Since the provincial codes sometimes include objectives not addressed in the national codes, code users' views on these additional objectives will also be sought.

In the past, such consultations have usually been held separately, at both the national and provincial/territorial level. The upcoming, jointly organized consultations signal the implementation of the new coordinated code development and review system. This system will involve the provinces and territories at every stage of code development so that when the new codes are published, there will be no surprises. Hence adoption by the provinces and territories will proceed more quickly than has been possible in the past.

Code users from provinces with provincial codes who have not participated in national consultations in the past are encouraged to do so this time. If you would like to receive the information package, please send us your name and address and indicate which of the three codes you are interested in.

By mail:
Public Review of Objectives, Canadian Codes Centre, National Research Council,
1500 Montreal Road, Ottawa, ON K1A 0R6

By e-mail:
codes@nrc.ca

For the latest information on the public consultations, go to *http://www.ccbfc.org/ccbfc/tgs/obc/public.shtml* or go to *http://www.ccbfc.org* and follow the links.

Frank Lohmann is with the Canadian Codes Centre of the National Research Council's Institute for Research in Construction.

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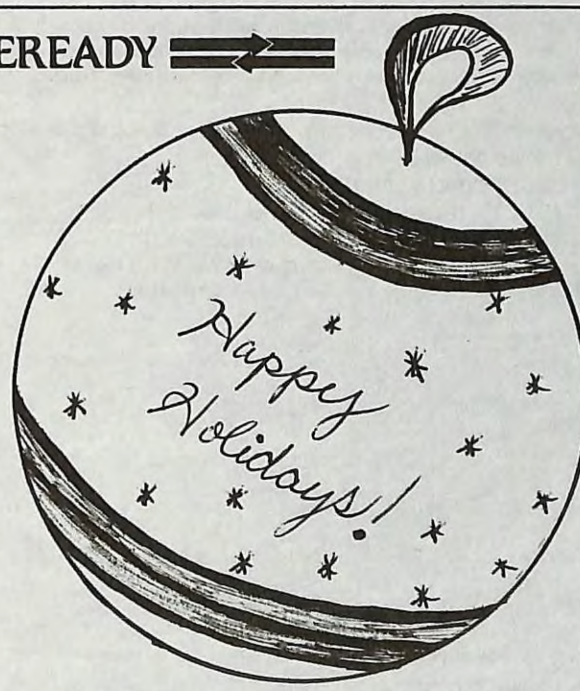

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December 5-9, 2000
Home Performance Strategies (training events)
San Ramon, Ca
Tel: 7241-223-7750
Fax: 724-223-7754
www. Affordablecomfort.org

January 17-18, 2001
Ontario Builders Forum
Toronto, Ontario.
Tel: 416-447-0077
Fax: 416-443-9982

February 18-21, 2001
CHBA National Conference
Edmonton, AB
Tel: 905-954-0730
Fax: 905-954-0732

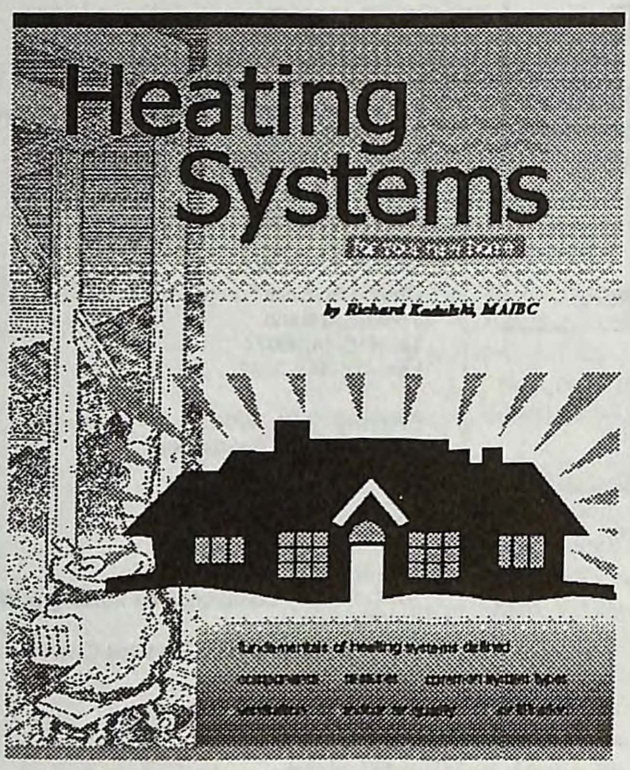
February 22-23, 2001
8th Canadian Conference on Building Science and Technology
by the Ontario Building Envelope Council
Toronto, ON
Tel: 877-235-6232

March 1-4, 2001
World Sustainable Energy Day Conference and Trade Show
Wels, Austria
Tel: +43 732 6584 4380
Fax: +43 732 6584 4383
www.esv.or.at

April 30 - May 5, 2001
Affordable Comfort 2001
(Home performance industry's largest conference)
Milwaukee, WI
Tel: 7241-223-7750
Fax: 724-223-7754
www. Affordablecomfort.org

Renewable Energy Education
Variety of courses on photovoltaic system design and installation, micro hydro, wind power, passive and active solar. Most courses in Carbondale Colorado, from May to October. For detailed schedule and course outline: Solar Energy International. Tel: 970-963-8855; Fax 970-963-8866; www.solarenergy.org

October 24-27, 2001
EEBA Conference
Orlando, Florida
Tel: 952-881-1098
Fax: 952-881-3048
www.eeba.org



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